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## CLINICAL ASPECTS OF BOTULISM

Prof. K. V. Bunin and N. I. Rashba

Botulism is one of the infections that has been almost completely eliminated in our country. However, sporadic cases of the disease are found even now. For example, from 1953 through 1961, eight patients were hospitalized with botulism at the Seventh Moscow City Hospital. The patients treated at this clinic were of considerable interest in regard to the characteristics of the course of botulism, its epidemiology, and treatment.

The present work describes the characteristics which we detected. In addition, we consider it necessary to remind doctors once again about this disease since practice shows that it is frequently forgotten, and as a consequence of this an untimely diagnosis is made.

Of the 8 patients under our observations, 5 were men and 3 were women; all were young, only one patient was over 30 years old. No serious concomitant diseases were noted in any of them; one female patient had a rheumatic defect of the heart, but in the stage of complete compensation.

We diagnosed botulism in 6 patients on the basis of the typical clinical picture, and in the other two, in addition to this, it was

reinforced by the detection of botulin in the blood of the patients.

Three of the patients were admitted to the hospital on the 2nd day of illness, one on the 3rd day, one on the 4th day, two on the 6th day, and one on the 22nd day. The latter admittance of some patients (on the 6th and 22nd day of the disease) is explained not only by the difficulty of diagnosing botulism, but also by the inadequate familiarity with this disease by doctors of the polyclinic network. For example, a typical clinical picture of botulism was observed in female patient I. who was admitted on the 22nd day of the infection. Moreover, three members of her family who ate home-prepared ham were infected along with her. But in spite of the group character of the illness, not one of the patients was correctly diagnosed and no specific (serum) treatment carried out.

An erroneous diagnosis was made in another group case of the illness: five young persons became ill after consuming Caspian sardines in tomato sauce. Three of them were treated at our hospital, whereby the first two hospitalized were sent with the diagnosis of diphtheria.

It is interesting that within each of the two groups of those ill, the clinical picture of botulism was characterized by very similar symptoms, whereas between the groups of patients affected as a consequence of consuming various foodstuffs, there were substantial clinical differences. For example, in persons who became ill after eating sardines, bulbar disorders were primarily demonstrated (difficulty in swallowing, breathing, dysarthria, etc.). In the other group of patients ill from infected ham, there were no profound bulbar lesions; they were disquieted by dryness of the mouth, difficulty of vision, constipation, general asthenia. This was noted as long ago as 1937 by N. V. Mirtovskiy and N. A. Govseyev. The cause for this phenomenon is still unclear and

cannot be explained, as K. I. Matveyev (1959) indicated, by the effect of different types of Cl. botulinum.

The development of clinical symptoms in our patients did not differ in general features from that described in the literature. The onset of the disease was acute in all patients. Characteristic neurological changes (difficulty in swallowing and vision, diplopia, vertigo) were noted in one patient on the very first day of illness; neurological disorders appeared in 3 patients from the 2nd day of the disease, and by the 3rd day all patients had such disorders. A further increase of neurological symptoms continued up to the 5th day of illness. At the period of maximal development of the disease, 4 of the 8 patients examined had headaches, 2 had dizziness, 2 had dyspnea, 3 had dysphagia, 7 with speech disorders, 4 had limited movement of the soft palate, 4 lacked or had a reduced palatal reflex, 4 had infections of the sclera, 3 had limited side motion of the eyeballs, 3 had mydriasis, 6 had ptosis, 4 had nystagmus, 2 had anisocoria, 3 had diplopia, 3 had weakness of convergence, 2 had difficulty of vision, 2 had deviation of the tongue, 5 had slight paresis of the facial nerve, and 1 patient had dysuria. In patient I., dysphagia was so expressed that obstruction of the esophagus was suspected and he was sent to the surgical department, where esophagoscopy and roentgenoscopy of the stomach were performed.

Patient I, age 23, arrived at the Infectious Disease Clinic of the I. M. Sechenov I Moscow Medical Institute on October 11, 1958, on the 6th day of sickness. It was revealed from the anamnesis that at about noon on October 5 canned fish was eaten. On the evening of the same day, dryness of the mouth and the sensation of "uncomfortableness" on swallowing were felt. On the morning of October 6 the patient had a headache, dizziness, dryness of the mouth; he couldn't read because the "letters were scattered" (owing to diplopia). Swallowing both solids and liquids became impossible, water

poured out through his nose. These symptoms progressed. The parents, disturbed by this, called the doctor who hospitalized the patient in the surgical department of the I City Hospital on October 8 with the diagnosis: acute obstruction of esophagus.

Esophagoscopy and X-ray examination of the patient, carried out at the hospital, did not reveal any mechanical obstruction in the esophagus, but persistent esophagospasm in a limited area below the pyriform sinus was established. Then the patient was transferred to the department for poliomyelitis patients, however a careful investigation did not reveal symptoms of poliomyelitis and, finally, with a diagnosis of a bulbar form of botulism the patient was directed to our clinic.

Difficulty in swallowing, dryness of the mouth, diplopia, flickering of "flies" and the sensation of "grates" before the eyes were evident on admission of the patient. The temperature was elevated to 38.5-38.8° during the first days, then subfebricity was observed; consciousness remained clear, speech was difficult.

We noted mydriasis with inequality of their width (the left pupil was wider, anisocoria), disorders of convergence, ptosis of the upper left eyelid, painfulness of the exit points of the trigeminal nerve. The velum palatinum drooped on the right, the palatal reflex was not evoked, the right arch was higher than the left, the uvula sloped to the left. Swallowing was difficult and imbibed water (based on the data of laryngoscopy) remained at the level of the pyriform sinus. Sluggish movement of the right vocal cord was observed on the 8th day of illness.

The patient had a disorder of external respiration (the ribs did not participate in the respiratory act). Persistent bradycardia was observed during the 14 days from the onset of the disease: pulse 56-59 beats per min at a temperature of 37.2-37.3°, 44-48 beats at normal temperature. Dryness of the mucous membranes of the mouth, persistent constipation. Swallowing reflex absent up to the 10th day of illness, patient had to be fed through a tube, later he started to swallow first liquid and then solid food. The neurological symptoms in the eyes persisted to the 14th day of the disease.

Hemogram on the 6th day of disease: leukocytes 12,000, esinophils 2%, plasma 23%, serum 52%, lymphocytes 18%, monocytes 5%; ESR 10 mm/hr. Cerebrospinal fluid on the 6th day of disease was without special characteristics. No pathological changes were in the urine. Although treatment with antitoxin, antibotulin serum was started late (from the 6th day of disease),

nevertheless at a sufficient dose it produced favorable results and the patient was discharged without any residual phenomena.

Gradual involution of the neurological phenomena began in 5 patients by the end of the first week; in 2 patients the pathological changes of the nervous system began to disappear considerably later: in one patient on the 17th day of infection and in the other on the 24th day.

Simultaneously with the neurological disorders or even somewhat preceding them, there occurred dyspeptic disturbances of various intensity. Vomiting was noted in 6 patients on the 1-2nd day of illness, 3 had dryness of the mouth, 3 had splanchnodynia, 3 were constipated and 3 patients had diarrhea, wherein in one patient it was multiple. Diarrhea continued 1-2 days and then was replaced by persistent constipation. All patients had the latter for a long time.

Only dullness of the heart tones, especially the first were recorded in the cardiovascular system. Arterial pressure remained normal. As a rule, the pulse did not exceed 80 beats per minute, but patient I., as indicated above, had bradychardia. Liver and spleen were not enlarged. There were no changes in the lungs.

In 5 patients the affection progressed at a normal temperature or with slight subfebrile elevations; a high temperature was noted in 3 patients for 1, 3, 10 days.

Fever developed in patient N. from the start of serotherapy and ended the day before stopping specific treatment. It was evident that the rise of temperature could not have been the consequence of a reaction to the injection of serum. There were no concomitant diseases which could have been the cause of the fever in N., as in two other patients with high temperature. This gives us grounds to assert that

the rise of temperature was caused by the botulin infection itself. Therefore, our few data once again confirm the validity of the observations of N. S. Slutskiy and co-authors (1934) and P. F. Changli-Chaykina (1937) that botulism can occur not only with a normal, but also with a high temperature, although the latter variant is found more rarely.

During reconvalescence, 2 patients developed complications of the peripheral nervous system. In patient M. we noted in the 17th day of infection a decrease of muscular strength and the development of a pain in the right hand, disorder of surficial sensitivity on the right to the D<sub>4</sub> level, and a decrease of reflexes on the right hand. In patient I., on the 38th day of infection, there occurred a sensation of cold in the right hand and in the right half of the thorax. There were no disorders in the sensory or motor spheres. Both patients were released from the hospital with slight residual neurological phenomena for out-patient care.

We were not able to find indications of possible neurological complications of this nature in the available literature. Only an article by A. N. Abramova (1937) gives a description of late (for 3-8th week of the disease) complications from the side of the motor apparatus, but even in this work only myositis is dealt with. Apparently the complications observed are rare developments of botulism. Their cause, possibly, are the degenerative changes in the nerve trunks which were described by A. P. Avtsyn and co-authors.

We will dwell on the laboratory results of finding toxin in the blood of the patients we examined. As was already mentioned, toxin could be found in the blood of only two patients: in one it was found on the 6th day of illness and in the other in the 4th week of the affection. This patient (I.) arrived at the hospital, as indicated above, on the 22nd day of the disease; type "B" botulin was found in



the blood taken on the day of admission at the laboratory of the N. F. Gamaley Institute.

The discovery of toxin in later periods of the disease is described in the literature. Kob found toxin on the 9th day of the disease, Weigeldt on the 22nd day, and Semegau on the 25th day (cited from N. V. Mirtovskiy's work). However, such findings are very few. Meanwhile they are of extremely important value since they serve as impressive proof of the toxico-infectious nature of botulism and indicate the possibility of prolonged circulation of toxin in the blood of patients. The presence of toxin in the blood at late stages of the disease can be explained only by the long-term presence of active microbes of botulism in the ill patients, possibly in their sporiferous form with subsequent growth into the vegetative form. Therefore, the use of serotherapy is necessary even in those cases where the patients are hospitalized for some reason on the 2-3rd or even 4th week of illness.

Four patients were given levomycetin in addition to serum (daily dose 3 g). The premise for this was the recommendation of many authors to use this antibiotic in salmonellosis which is, like botulism, a form of food poisoning; in addition, we took into account the experimental data of V. N. Derkach, who showed that the use of levomycetin together with antitoxin serum enhanced the action of the latter. However, in the four patients we observed we did not detect any advantages of combined treatment. Nevertheless, combined treatment of botulism with serum and antibiotics has pathogenic value and deserves additional development.

Three of the 8 patients under our observation were admitted to the hospital with the diagnosis of poliomyelitis. The affection occurred in them with expressed bulbar disorders. Such an error in the diagnosis is completely understandable since in certain forms of

poliomyelitis, bulbar disorders are prevalent in the clinical picture of the disease. However, in spite of the similarity we can find sufficient cause to carry out a proper differential diagnosis. Dryness of the mouth and neurological symptoms of the eyes, which are characteristic for botulism, are not generally encountered in poliomyelitis. On the other hand, "variegated" paralysis or paresis of the trunk musculature and of the extremities with early developed hypotrophy of the muscles, which are characteristic of poliomyelitis, are not found in botulism. In doubtful cases it is necessary to resort to injection of antibotulin serum since the latter, not adversely affecting poliomyelitis patients, plays a major role in the favorable outcome of botulism.

### Conclusions

1. The typical picture of botulism in individual cases can acquire a number of special features which are expressed in a rather prolonged elevation of temperature, the presence of diarrhea, and the late development of complications from the side of the peripheral nervous system.

2. Detection of toxin in the blood of a patient on the 22nd day of illness proves the need for using serotherapy in botulism patients even when they arrive late at the hospital.

3. According to our data, very similar clinical demonstrations of botulism are observed when several people are infected with the same foodstuff. Considerable differences in the clinical picture in different groups are present in group infections with different foodstuffs.

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